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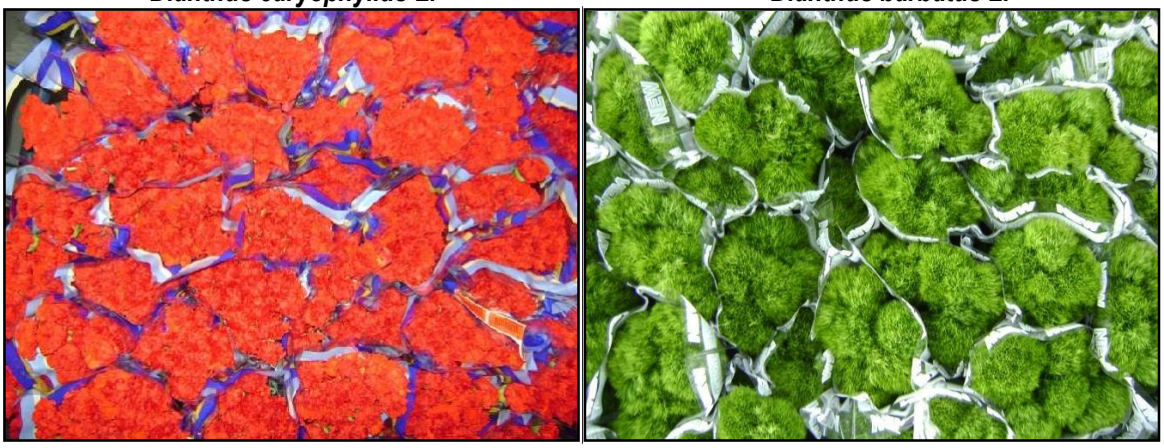
MINISTRY OF AGRICULTURE AND RURAL
DEVELOPMENT AGRICULTURAL COLOMBIAN INSTITUTE – ICA
SUBGERENCE OF PLANT PROTECTION
TECHNICAL DIRECTION OF EPIDEMIOLOGY AND PHYTOSANITARY SURVEILLANCE

PRODUCTIVE AND PHYTOSANITARY CHARACTERIZATION OF THE PRODUCTION SYSTEM OF *Dianthus* spp. IN COLOMBIA

***Dianthus caryophyllus* L.** | ***Dianthus barbatus* L.**



Taken by: ICA, 2017.

Bogotá D.C., Colombia
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Technical Management of Epidemiology and Phytosanitary

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INTRODUCTION

This document has been prepared on the basis of existing technical information, meeting the requirements established by the World Trade Organization (WTO) in the Agreement on the Application of Sanitary and Phytosanitary Measures of the Uruguay Round 1994 and the International Standards for Measures Phytosanitary (ISPMs) issued by the International Plant Protection Convention (IPPC). The information contained in this document comes from different bibliographical sources of a technical - scientific nature and the opinion of experts in production of Dianthus spp. In Colombia.

1. Scientific name (family, genus and species) and common name of the product to be exported

Table 1: Product Identification.

Scientific name:	*Dianthus caryophyllus* L. (NPGS, 2011)	*Dianthus barbatus* L. (NPGS, 2008)
Gender:	*Dianthus* (NPGS, 2011)	*Dianthus* (NPGS, 2008)
Family:	Caryophyllaceae (NPGS, 2011)	Caryophyllaceae (NPGS, 2008)
Common name:	Clavel (NPGS, 2011)	Imperial Carnation (NPGS, 2008)
Presentation:	Cut flower	Cut flower

2. Location and geographical description of production areas designated for export

In Colombia, most production cores of Dianthus spp. Are located in the department of Cundinamarca, some in the department of Antioquia and others in Bogota D.C. (Table 2) (Figures 1 and 2) (ICA, 2017a).

Table 2: ICA Registered Production Locations for Dianthus spp.

Production Locations Registered to ICA for Cut Flower Export of *Dianthus* spp.	
Department	**Municipality**
Antioquia	Cármen de Viboral
	Medellin
	Rionegro
Total	
Cundinamarca	Bojacá
	Cachipay
	Cajicá
	Chía
	Cogua
	Cota
	El Rosal
	Facatativá
	Fómeque
	Funza
	Gachancipá
	Guasca
	Madrid
	Nemocón
	Sesquilé
	Sibaté
	Soacha
	Sopó
	Subachoque

Production Locations Registered to ICA for Cut Flower Export ofe *Dianthus* spp.	
Department	**Municipality**
Cundinamarca	Suesca
	Tabio
	Tenjo
	Tocancipá
	Ubaté
	Zipaquirá
Bogotá D.C.	

Source: ICA, 2017a.

Antioquia

The department of Antioquia limits to the north with the Caribbean Sea; With the department of Córdoba, has as limits the mountains of Abibe and Ayapel and with the departments of Sucre and Bolivar, and the limits are the river Cimitarra with its tributary the Tamar in great part of its route. To the east it limits with the departments of Santander and Boyacá and serves as limit of the Magdalena river in a length of 254 kilometers (PNF, 2006).

To the south it borders with the department of Caldas, with the river La Miel and its tributary the South Samaná, the river Arma, the river Cauca between the mouths of the rivers Arma and Arquía, following the course of the latter to its birth in the Hill Los Mellizos and of this one by all the mountain range until the hill Paramillo; And the department of Risaralda, with limit in the continuation of the mountainous area that divides the hydrographic basins of the Cauca rivers, up Caramanta hill (PNF, 2006).

To the west, it borders the department of Chocó, bordering the Andes in some parts and the Atrato river in others (188 km), until reaching its mouth in the Gulf of Urabá (PNF, 2006).

The geographical coordinates that cross the ends of the department are located between 5 ° 25 'north latitude, southern part of Caramanta hill, in the municipality of Andes, and 8 ° 55' north latitude (Punta Arboletes, in the municipality of same name). In the longitudinal sense, the extreme coordinates of: 77 ° 07', free port on the Atrato River, in the municipality of Turbo, and 73 ° 53', Casabe off Barrancabermeja, in the municipality of Yondó (PNF, 2006; IGAC , 2007).

The department of Antioquia is divided into nine subregions which are: Aburra Valley, Lower Cauca, Magdalena Medio, Norte, Occidente, Oriente, Southeast and Urabá (PNF, 2006). Geology is linked to the history of the formation of the Western and Central Cordilleras and the plains and valleys. The geological material in the mountain ranges is very varied: sedimentary, metamorphic, metasedimentary and igneous rocks with plutonic inclusions, covered in some sectors by volcanic ash; In the valleys and plains the materials correspond to quaternary deposits of different granulometry, composition and age (IGAC, 2007).

The topography of the region of Antioquia is quite broken as it crosses the central and western ranges of the Andes that separate the valleys of the rivers Cauca and Magdalena, the first, and those of the rivers

Cauca and Atrato, the second. In the center of the department is located the Metropolitan Area of the Valley of Aburrá with 1,152 Km2 (1.8% of the departmental total) and the capital Medellin with 382 Km2 (IGAC, 2007).

Cundinamarca – Bogotá D.C

It is located in the central zone of the national territory, in the Andean Natural Region and on the Eastern Cordillera where the city of Bogota is located, capital of the department and the country. The west of the department is formed by the depression that leads to the valley of the Magdalena River and the east by which forms the Piedmonte llanero (PNF, 2006).

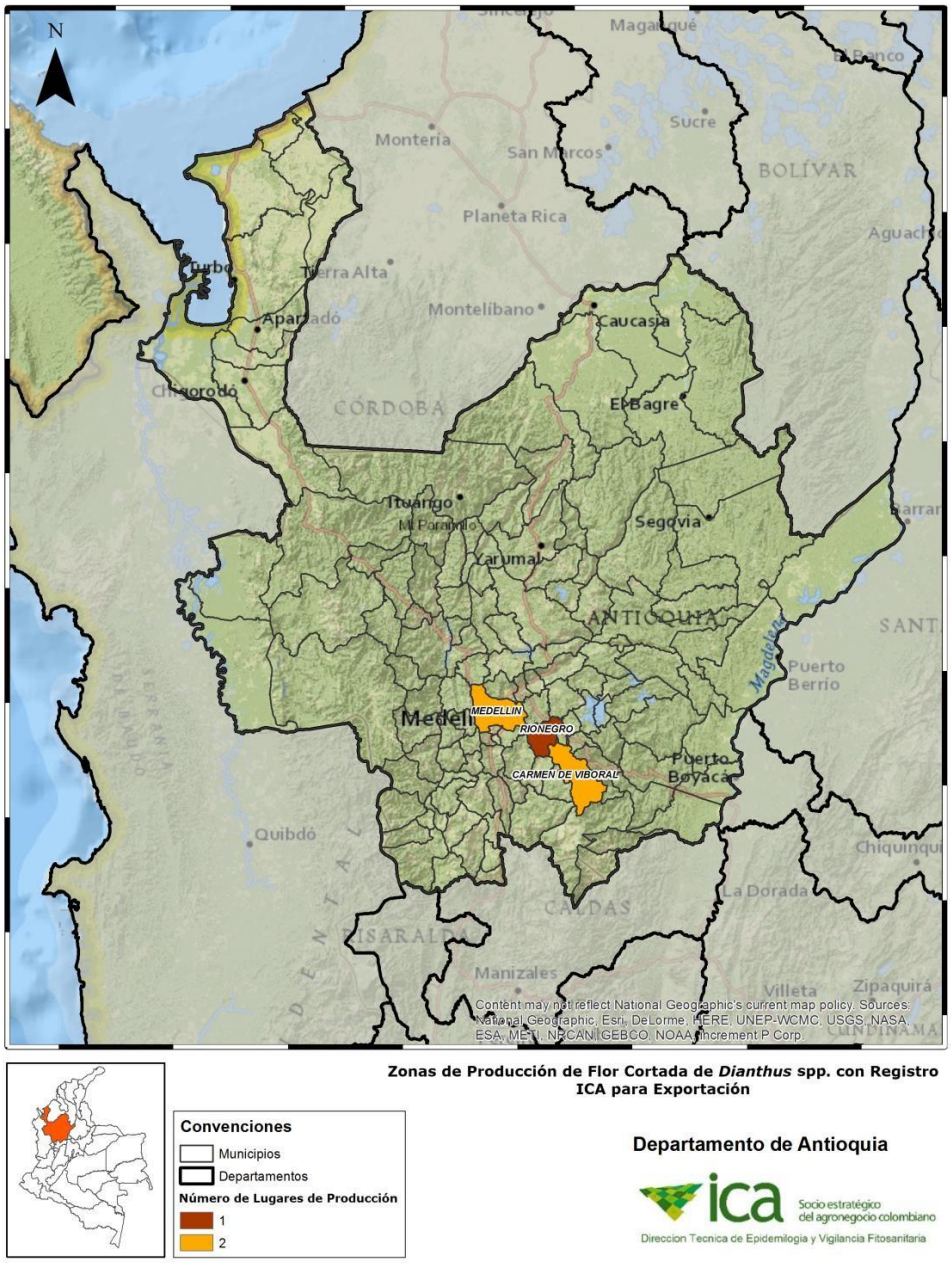
Geographically it is framed by the coordinates 3 ° 42 'and 5 ° 51' north latitude, and 73 ° 03 'and 74 ° 54' west longitude of Greenwich. In the north, it borders on the department of Boyacá, on the south with the departments of Meta, Huila and Tolima, on the east with the departments of Boyacá and Meta and on the west with the departments of Caldas and Tolima (PNF, 2006).

Taking into account the previous definition of limits, the department of Cundinamarca has an area of 24,210 km2 including water bodies (rivers, lakes and lagoons), an area that represents approximately 2.1% of the country's area (PNF, 2006).

In the greater part of the region belonging to the jurisdiction of the department of Cundinamarca, both the sedimentary rocks of marine environment predominate, as well as the sedimentary rocks of continental environment. Towards the southeastern sector of the department and rising to a lesser extent, are metamorphic and metasedimentary rocks of the Paleozoic. Outcrops in small nuclei are sedimentary rocks of the Jurassic, which together with the rocks of the Paleozoic form the basement on which lie powerful sequences of sedimentary rocks folded and fractured cretaceous and Tertiary that in many places are buried by extensive deposits of the Quaternary Of different origin, that make up the current geological expression (IGAC, 2007). In the department of Cundinamarca the following landscapes are found: mountain, lomerío, piedemonte, plain and valley (IGAC, 2007).

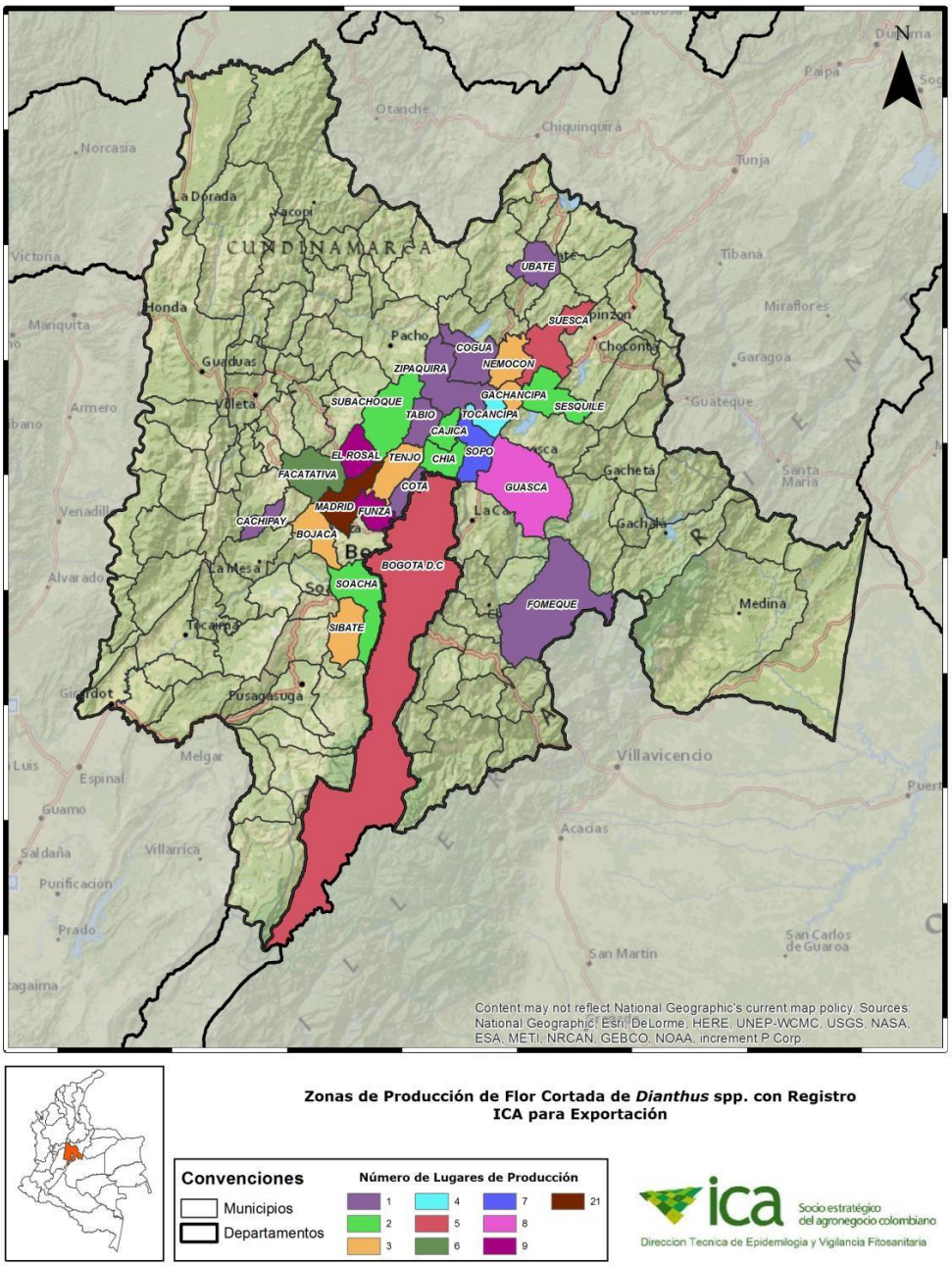
3. Maps of the country indicating the location of the production zones

Figure 1: Production Zones Cut Flower of Dianthus spp. With ICA Registration for Export: Department of Antioquia



Source: ICA, 2017.

Figure 2: Production Zones Cut Flower of Dianthus spp. With ICA Registration for Export: Department of Cundinamarca



Zonas de Producción de Flor Cortada de *Dianthus* spp. con Registro ICA para Exportación

Convenciones

Municipios

Departamentos

Número de Lugares de Producción

1 2 3 4 5 6 7 8 9 21

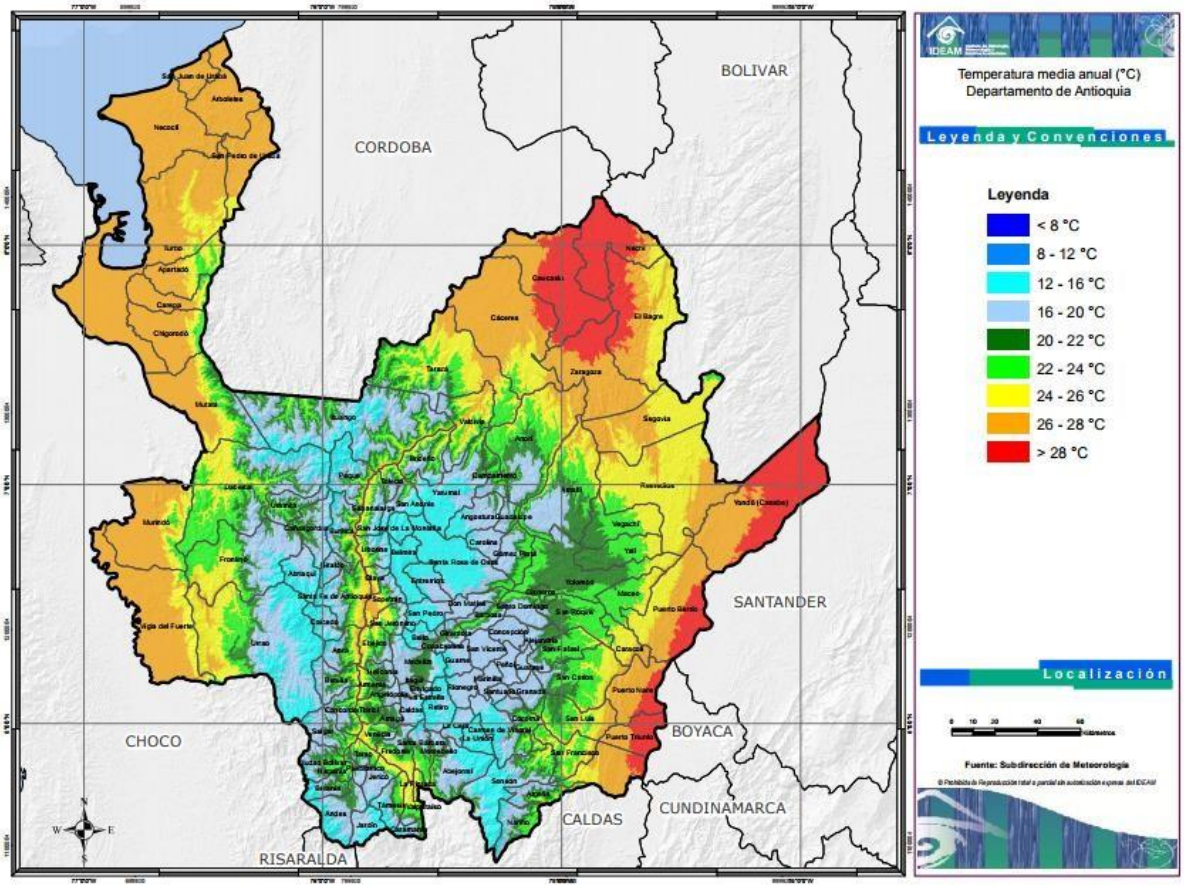
ica Socio estratégico del agronegocio colombiano

Direccion Tecnica de Epidemiologia y Vigilancia Fitosanitaria

Source: ICA, 2017.

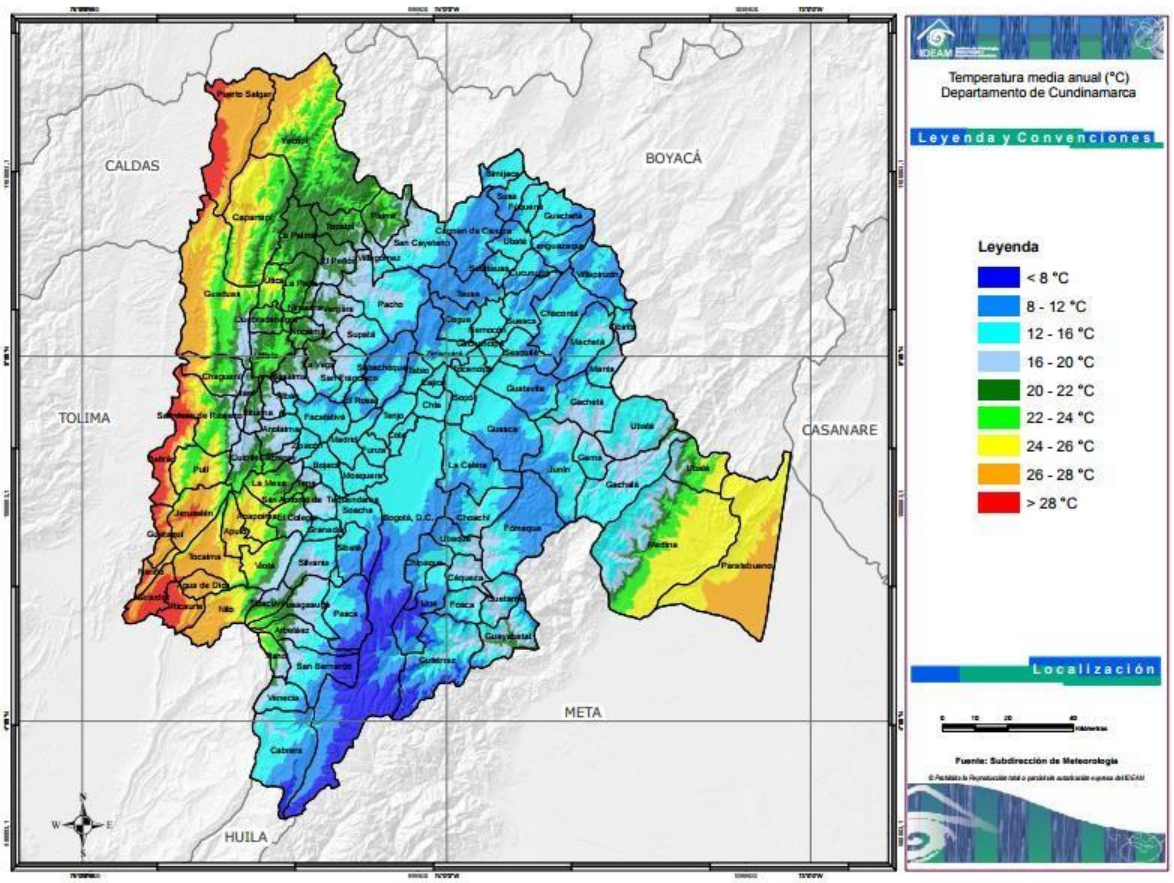
4. Climatic conditions of production areas

Figure 3: Average Annual Temperature (° C) of the Department of Antioquia



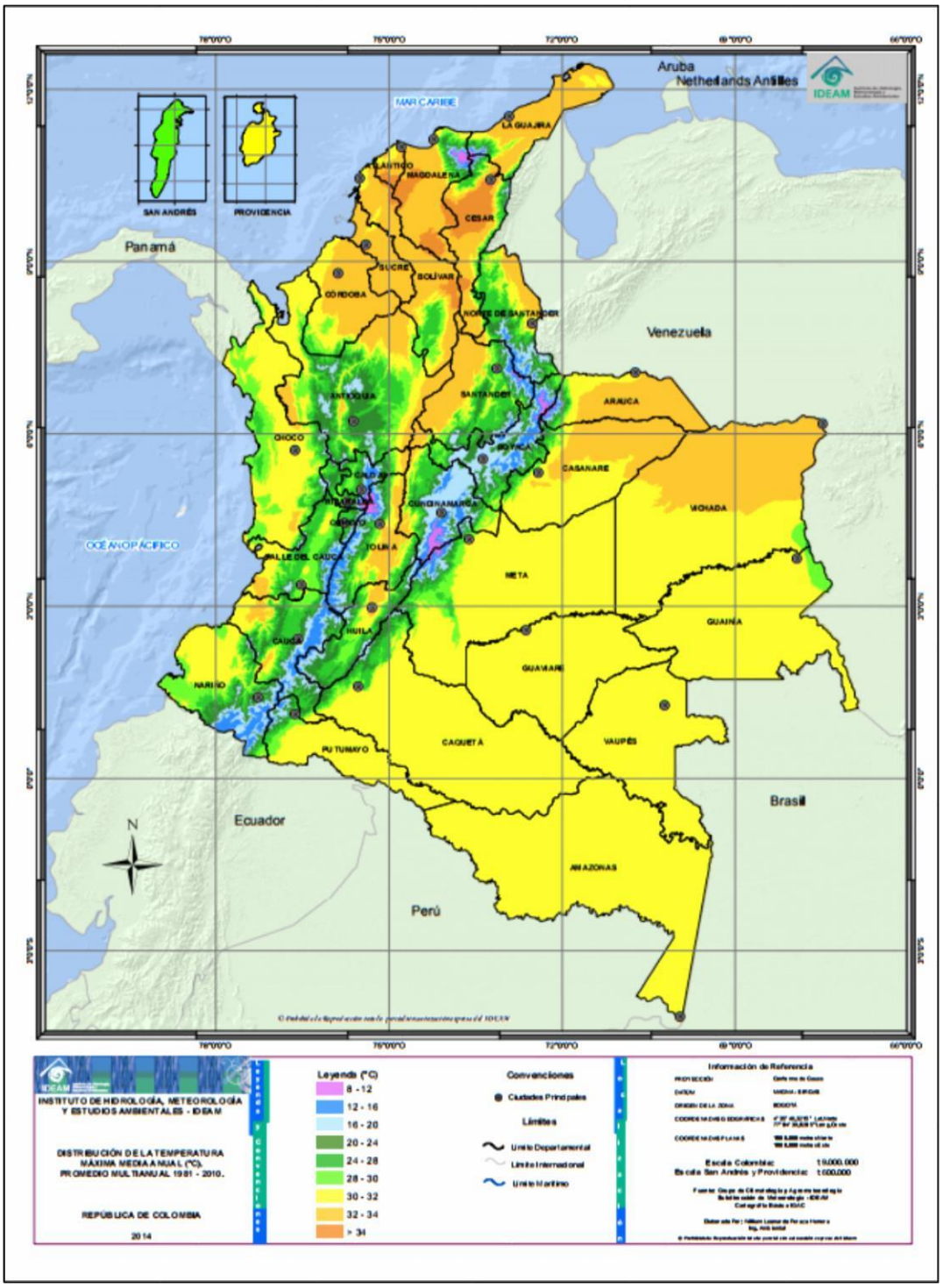
Source: IDEAM, 2017.

Figure 4: Average Annual Temperature (° C) of the Department of Cundinamarca



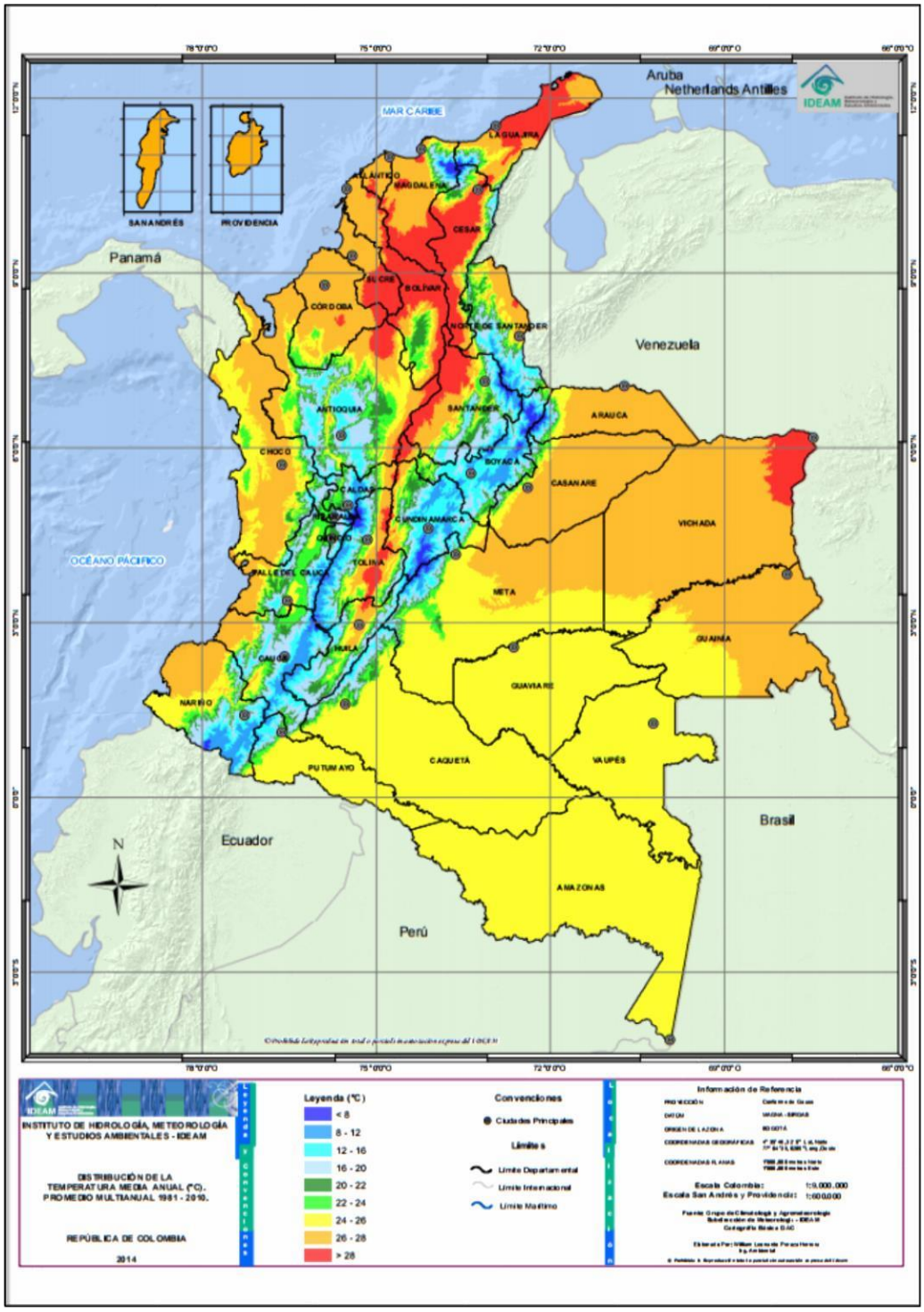
Source: IDEAM, 2017.

Figure 5: Distribution of the Maximum Average Annual Temperature (° C) Republic of Colombia



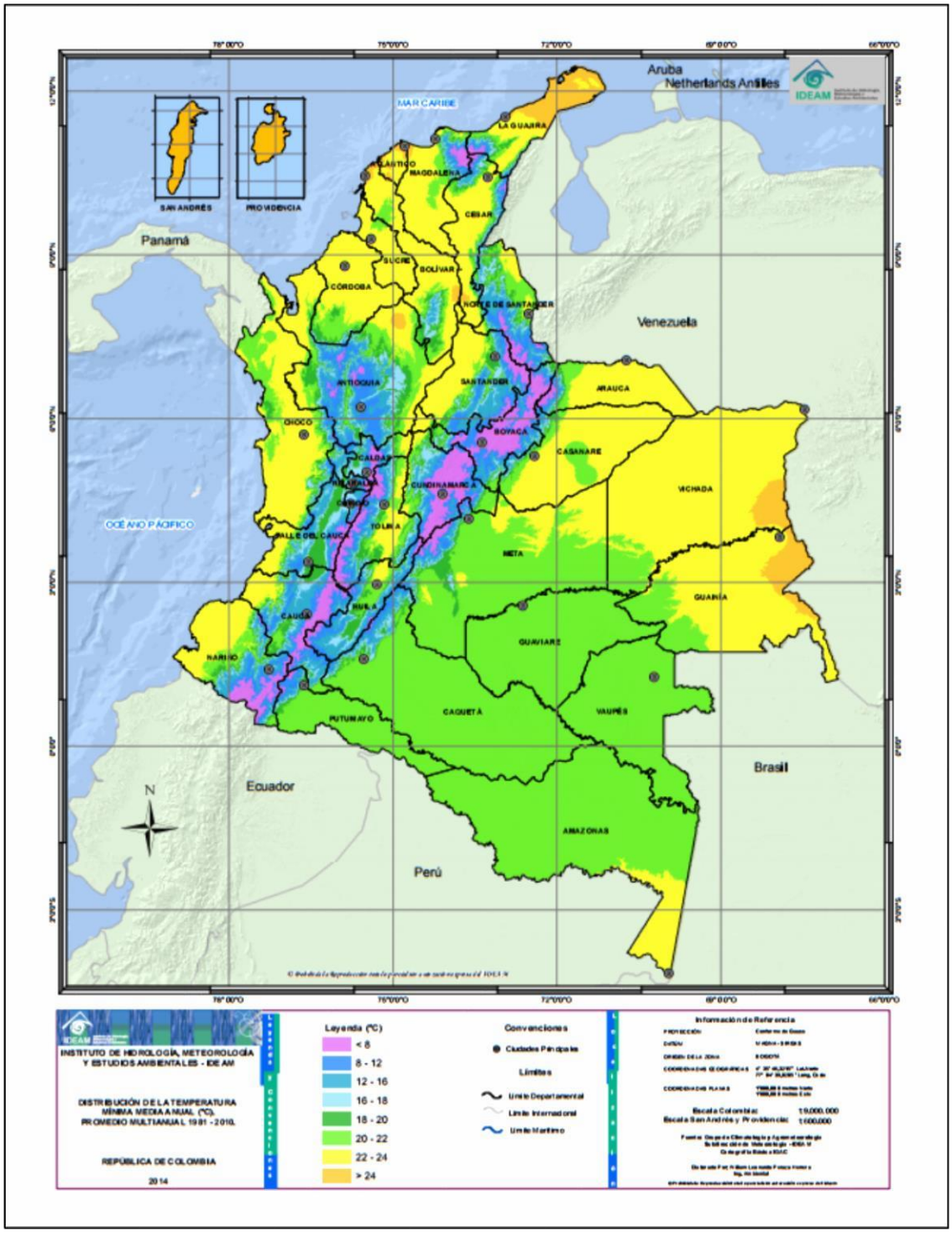
Source: IDEAM, 2017.

Figure 6: Distribution of Annual Average Temperature (° C) Republic of Colombia



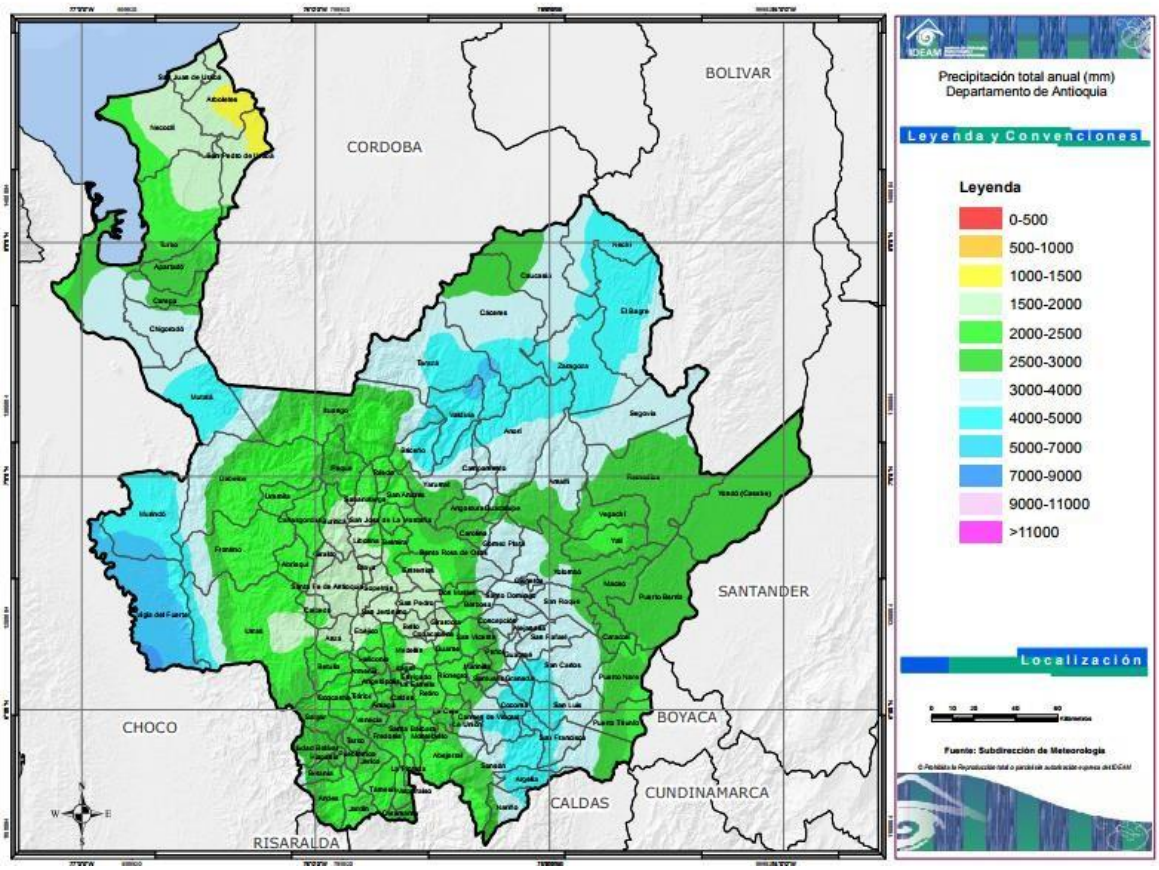
Source: IDEAM, 2017.

Figure 7: Distribution of Average Annual Minimum Temperature (° C) Republic of Colombia



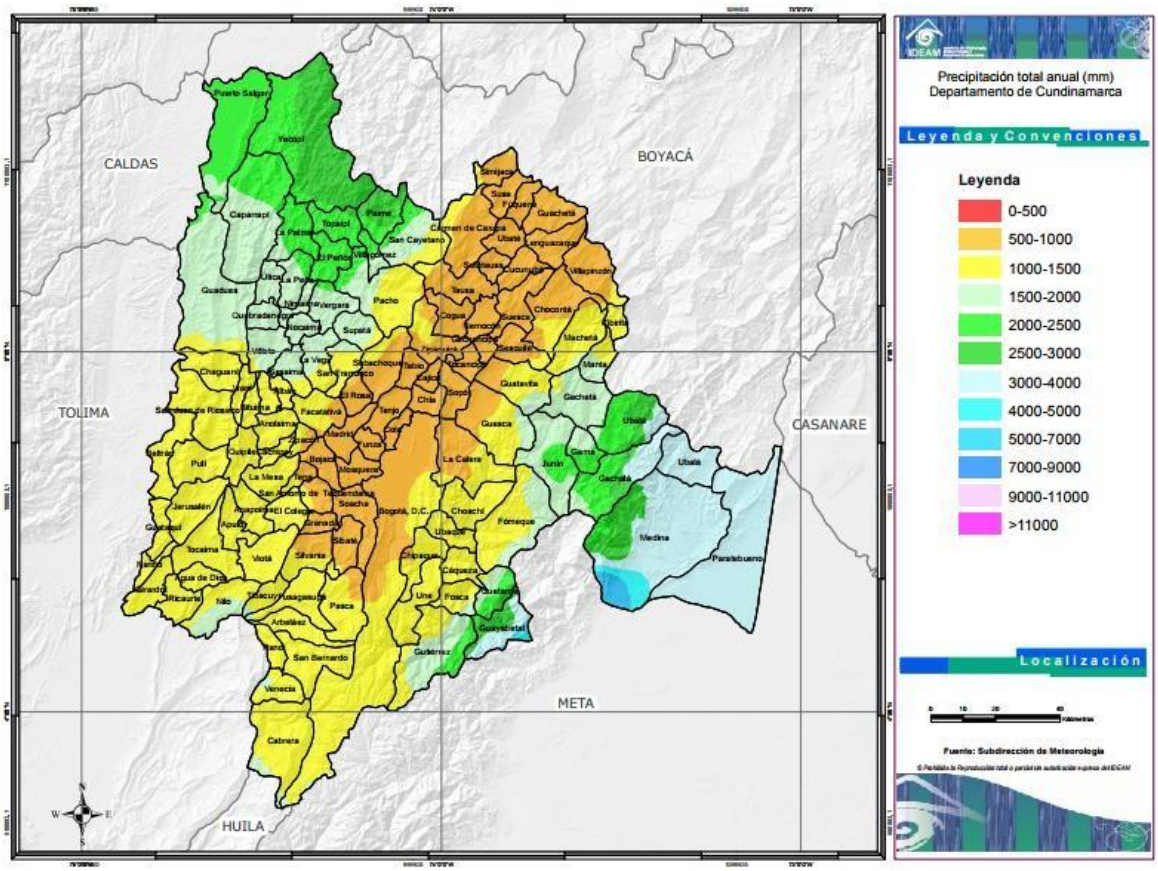
Source: IDEAM, 2017.

Figure 8: Annual Total Precipitation (mm) in the Department of Antioquia



Source: IDEAM, 2017.

Figure 9: Annual Total Precipitation (mm) of the Department of Cundinamarca



Source: IDEAM, 2017.

5. Significant pests associated with the part of the plant to be exported

Table 3: List of Significant Pests Associated with the Production Systems of Dianthus spp.

SCIENTIFIC NAME OF PEST	COMMON NAME OF PEST	TAXONOMY	PHENOLOGICAL STATUS OF CULTIVATION	AFFECTED PLANT PART	DISTRIBUTION IN COLOMBIA
Botryotinia fuckeliana (de Bary) Whetzel	Rot of flowers (Arbeláez, 1999) Moho gris de la flores (Buriticá, 1999)	Ascomycetes, Helotiales	Flowering (Arbeláez, 1987)	Flower (Arbeláez, 1987)	Antioquia and Cundinamarca (Buriticá, 1999)
Fusarium oxysporum f. sp. *dianthi* (Prillieux & Delacroix) W.C. Snyder & H.N. Hansen	Vascular wilting (Ceballos *et al.*, 1990)	Ascomycetes, Hypocreales	It can affect the plant in any phenological state (Florval S.A.S. Sede QFC, 2017)	Stem (Ceballos *et al.*, 1990)	Sabana de Bogotá (Ceballos *et al.*, 1990)
Fusarium roseum Link: Fr.	Debris from the stem base (Buriticá, 1999)	Ascomycetes, Hypocreales	Propagation and in productive phase (Arbeláez, 1987)	Stem (Buriticá, 1999)	Antioquia and Cundinamarca (Buriticá, 1999)
Heterosporium echinulatum var. dianthi Losa	Ringed leaf spot Purple stain (Buriticá, 1999)	Ascomycetes, Mycosphaere-llales	Rooting and productive phase (Arbeláez, 1987)	Leaf (Arbeláez, 1987)	Antioquia and Cundinamarca (Buriticá, 1999)
Peronospora dianthicola	Mildeo velloso (Arbeláez, 1987) (Buriticá, 1999)	Oomycetes, Peronosporales	It can affect the plant in any phenological state (Florval S.A.S. Sede QFC, 2017)	Leaf (Arbeláez, 1987)	Cundinamarca (Buriticá, 1999)
Myzus persicae(Sulzer)	Pulgón verde de la papa (Gallego & Vélez, 1992)	Hemiptera: Aphididae	It can affect the plant in any phenological state (Florval S.A.S. Sede QFC, 2017)	N/D	Cundinamarca (Funza) (Bustillo & Sánchez, 1977)
Tetranychus urticae Koch	Arañita roja (Murillo & Mosquera, 1984)	Acarina: Tetranychidae	It can affect the plant in any phenological state (Florval S.A.S. Sede QFC, 2017)	Leaf (Getiva & Acosta, 2004)	Cundinamarca (Savannah of Bogota) (Murillo & Mosquera, 1984)
Frankliniella occidentalis (Pergande)	N/D	Thysanoptera: Thripidae	It can affect the plant in any phenological state (Florval S.A.S. Sede QFC, 2017)	Flower (Mound & Isaza, 1994)	Cundinamarca (Sabana de Bogotá) (Mound & Isaza,1994)

***Botryotinia fuckeliana* (de Bary) Whetzel**

This fungus acts primarily as a saprophyte and necrophiliac and is initially established in decomposing or weakened plant parts and subsequently spreads to the rest of the plant's healthy tissue. It can be a secondary invader attacking plants already infected by another pathogen. At the same time, it is considered a primary pathogen because it can penetrate directly into its hosts through the cuticle through the production of enzymes that degrade its components (Gómez, 2013).

There are four major types of dispersal propagules in the epidemiology of this fungus: ascospores, conidia, mycelium and sclerotia. It is believed that microconidia are produced only on sexual function and chlamydospores and oidia have unknown and probably unimportant functions. Conidia are released by a hygroscopic mechanism and are therefore more abundant in the air when rapid changes of relative humidity occur during the day and are easily spread by air. Sclerotia can also produce microconidia (CABI, 2016).

The optimal temperature for spore formation is between 15 and 20 ° C for mycelial growth. At temperatures below 15 ° C, the rate of sporulation drops considerably and at 10 ° C is only 10% of sporulation at 15 ° C or even less. Approximate optimum relative humidity is 90% for spore production; Most spores occur at night, provided the temperature is high enough (CABI, 2016).

The optimum temperature for spore formation is B. cinerea mycelium consists of a set of cuboidal, cylindrical hyphae or filaments that multiply by cytoplasmic division, it being common for it to have a nuclear division without cytoplasmic division. This gives rise to cenocytic hyphae with a high and variable number of nuclei. It is characterized by its branched conidiophores and is regularly found on the surface of infected tissues (Gómez, 2013). Vegetable remains containing mycelium as dispersal propagules and being washed away by wind and rain are a large inoculum (CABI, 2016). Between 15 and 20 ° C for mycelial growth. At temperatures below 15 ° C, the rate of sporulation drops considerably and at 10 ° C is only 10% of sporulation at 15 ° C or even less. Approximate optimum relative humidity is 90% for spore production; Most spores occur at night, provided the temperature is high enough (CABI, 2016).

***Fusarium oxysporum* f. sp. *dianthi* (Prillieux & Delacroix) W.C. Snyder & H.N. Hansen**

The optimal temperature for spore formation is B. cinerea mycelium is composed of a set of tabhy, cylindrical hyphae or filaments that multiply by cytoplasmic division, being common that it has a nuclear division without cytoplasmic division. This gives rise to cenocytic hyphae with a high and variable number of nuclei. It is characterized by its branched conidiophores and is regularly found on the surface of infected tissues (Gómez, 2013). Vegetable remains containing mycelium as dispersal propagules and being washed away by wind and rain are a large inoculum (CABI, 2016). Between 15 and 20 ° C for mycelial growth. At temperatures below 15 ° C, the rate of sporulation drops considerably and at 10 ° C is only 10% of sporulation at 15 ° C or even less. Approximate optimum relative humidity is 90% for spore production; Most spores occur at night, provided the temperature is high enough (CABI, 2016).

When the plant dies, the fungus colonizes other tissues, sporulating by producing microconidia and macroconidia on the surface and differentiating the chlamydospores inside. Microconidia and macroconidia are formed in viscous masses that are dispersed locally by the flow of water and splash drops. The movement of contaminated soil or plant material can transmit the fungus considerably (CABI, 2017).

***Fusarium roseum* Link: Fr.**

It is a soil fungus that survives with decaying organic matter. It penetrates through susceptible tissues such as wounds. It is an imperfect fungus that sporulates abundantly on the surface of the host 's tissue, on sporodium or fructifying structures of a typical pinkish - peach color, surrounded by white cottony mycelium. It does not form chlamydospores and microconidia are scarce. It forms macroconidia, long and thin with three or more septa (Pizano, 2000).

***Heterosporium echinulatum* var. *dianthi* Losa**

The pathogen causes stains on leaves, stems, sepals and occasionally on petals of very susceptible varieties. On the underside of the leaves sporulation is very abundant mainly in humid times (Arbeláez, 1987). The spots are rounded on the leaves and a vinous pink (Bigre, 1987).

Peronospora dianthicola

In most of the mildeos, sporangia germinate usually by zoospores or by germinal tubes at high temperatures; However, in the genus Peronospora the sporangia germinate only by means of a germinal tube for this reason they are considered as spores and not as sporangia and are denominated conidia, which always germinate through germinal tubes (Agrios, 1988).

***Myzus persicae* (Sulzer)**

In open field conditions, many species of aphids have a primary host on which they reproduce sexually and asexually and a secondary one giving rise to a viviparous and parthenogenetic development. Its migration occurs through its winged forms from one plant to another. In many species of aphids males are produced when the temperature drops, resulting in sexual reproduction. Paired females lay eggs with better conditions to survive. Aphids migrate to woody plants to lay eggs when the weather is unfavorable (Gill et al., 2001).

***Tetranychus urticae* Koch**

According to studies by Patil et al., (2014) in the biology of Tetranychus urticae Koch on carnation under laboratory conditions (27.79 ± 4.40 ° C temperature and 79 ± 5.75% relative humidity), it is concluded That the life cycle of this mite consists of five stages: eggs, larvae, protoninfa, deutoninfa and adult and an inactive short stage called quiescent stage. The egg incubation period was 3.29 ± 0.62 days. The larval body measured 0.14 ± 0.01 mm in length and 0.10 ± 0.01 mm in width and lived for 1.79 ± 0.64 days in males and 2.71 ± 0.57 days in females. The mature larva entered a quiescent stage. The total development period was longer in females (10.61 ± 1.21 days) compared to males (8.44 ± 1.75 days). Paired females lived longer and laid more eggs than unpaired females. Paired females produced offspring of both sexes, while unpaired females gave rise to male progeny (Patil *et al.*, 2014).

***Frankliniella occidentalis* (Pergande)**

The life cycle comprises an egg state, two stages of active larvae, two stages of pupa, relatively quiescent, and the adult state (Reitz, 2009).

The larvae are yellow to orange-yellow. These insects have 8 antennal segments. The population of F. occidentalis is composed of males and females, the latter being larger and darker than the males. The abdomen

of the males has two spots of orange color, that of the females narrows in top shape to one end leaving the ovipositor visible. Population development depends on temperature, relative humidity and host plant species. The fastest development occurs at 30 ° C; Stops above 35 ° C and below 10 ° C. Reproduction is sexual or asexual. The offspring of unfertilized females is male, that of females is male and female in a ratio of 2: 1, respectively (Malais & Ravensberg, 2006).

6. Production methods including description of propagation, crop and pest management

From the 1990s onwards, the use of hydroponics or carnation and mini-carnation in soilless substrate was started in Colombia as an alternative to the expensive soil disinfection necessary for the control of Fusarium oxysporum f. Sp. Dianthi and its limited effectiveness (Pizano, 2000). For this reason, nowadays in Colombia, the vast majority of productive systems of Dianthus spp. Are carried out on hydroponic beds.

Figure 10: Developmental stages of Dianthus spp.

Dianthus caryophyllus L. *Dianthus barbatus* L.


Propagation (Taken by: ICA, 2017).


Vegetative Phase (Taken by: ICA, 2017).

Production Phase (Taken by: ICA, 2017).

Spread of *Dianthus* spp.

Producers of propagating material must be registered with the ICA, for this they must demonstrate that it has the necessary facilities and equipment to produce and commercialize quality material. The propagation of the crop includes several phases in obtaining the commercial plants or final cuttings, as well as health tests or evaluations (Pérez, 2003):

- Infrastructure for propagation
- Greenhouses for mother plants
- Irrigation and fumigation booth
- Irrigation equipment (misting, dripping and sprinkling)
- Nebulization control equipment
- Mother plant banks and rooting
- Plastic baskets for harvesting and storing cuttings
- Cutting adaptation area (pre-cooling)
- Cold room for cutting with and without root

Cutting propagation program for cutting (Florval S.A.S. Headquarters QFC, 2017 and 2017a)

Introduction: direct importation of plant material from the plant breeders themselves, as well as their propagation with authorization and evaluation; In some places of production of cut flower of Dianthus spp.se propagates the vegetal material. There is an evaluation process that must be taken into account: parameters of identity (related to the type of cultivar), novelty (in relation to its appearance on the market), distinguishability (associated with productivity, number of petals, Height and diameter) and genetic stability (Pérez, 2003).

Indexing: is a test that is performed in order to evaluate if the imported cuttings for Dianthus caryophyllus propagation are free of pathogens, particularly Fusarium oxysporum, which is the most limiting pathogen in carnation production. A cut is made at the base of the cutting, carried to a culture medium and the presence of pathogens is checked. After the indexing process, results are obtained: negative (lead to the formation of mother plants) or positive (which are discarded).

Mothers' plants: they are managed in greenhouse with plastic cover, in elevated benches in which coal slag is used as substrate. Propagation banks are steam sterilized at 92 ° C for 2.5 hours.

The cycle of the mother plants of Dianthus caryophyllus is between 35 and 40 weeks. When harvesting cuttings there must be 2 to 3 pairs of leaves in the plant, per stem harvested. The harvested cutting should be 3 to 4.5 pairs of leaves and the base should be flat. The cycle of the mother plants of Dianthus barbatus is between 12 and 16 weeks. When harvesting cuttings there must be 2 pairs of leaves in the plant, per stem harvested. The harvested cutting should be left with 2.5 pairs of leaves and the base should be flat.

The cuttings of D. caryophyllus and D. barbatus are stored temporarily in a cold room (at a temperature between 1 - 2 ° C and 90% relative humidity). Each mother plant produces 40 cuttings on average per cycle.

Rootstocks of commercial plants: D. caryophyllus cuttings are hormonalized at the base to stimulate their rooting. They are sown on coal slag and have a cycle between 20 and 24 days depending on the variety, since it is planted, rooted and ready to be transplanted to cultivation.

The cuttings of D. barbatus are hormones and rooted in trays using as a substrate a mixture of 70% of burned scale and 30% of slag. Its cycle is 35 days since it is planted, rooted and ready to be transplanted to cultivation. The pinch is done 28 days after sowing in the trays, leaving three pairs of leaves in the plant.

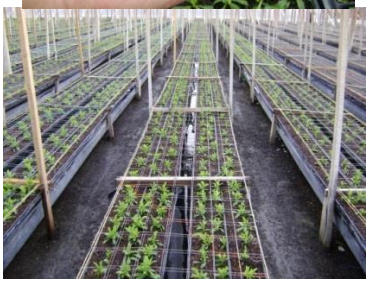
Table 4: Productive Process of Dianthus caryophyllus L. (Carnation and Mini-Carnation)

Productive Process of Dianthus caryophyllus L. (Carnation and Mini-Carnation)		
Operation	**Description** (Florval S.A.S. Branch QFC,	**Figures** (Taken by ICA, 2017)
Sowing	The plastic of the beds is washed and disinfected with sodium hypochlorite; Then the beds are filled with raw husk, burned husk and compost (this substrate is also disinfected). Before planting, wash the bed with water so that there is no residue of chlorine and do not burn the root. The average planting density is 29.5 plants / m2 greenhouse. Plant renewal is done every 89 to 90 weeks to 2 years. Plants should be accommodated the first week after planting so that they are well anchored in the substrate.	
Pinch or blunting		

Productive Process of Dianthus caryophyllus L. (Carnation and Mini-Carnation)		
Operation	**Description** (Florval S.A.S. Branch QFC,	**Figures** (Taken by ICA, 2017)
	This practice seeks to inhibit apical dominance and allow the plant to branch out. At 45 days after sowing a sampling is done to make the pinch, (there are early varieties that are very reproductive and must be pinch before and others are very vegetative that take longer). If the sampling indicates that 40% of the bed is to be pricked, selective pinch is started, then pinch over until the entire bed is blunt (for 4 to 5 weeks). Pinch is done when reproductive shoots appear, they must be removed.	
Empiole	It starts between week 10 and 11 after planting, in order to tutor and spruce the stems every two weeks, to prevent them from twisting. Eight floors are planted to guide stems as they grow.	
Desbotone (carnation) Descabece (mini carnation))	Desbotonado: the floral side buttons are eliminated; With this practice only the terminal flower is preserved. Bare: the apical floral button is removed; With this practice the secondary branch is stimulated.	
Cut	The flower is cut and packed in culture within tobaccos that have a capacity of 80 stems on average, depending on the variety.	

Productive Process of Dianthus caryophyllus L. (Carnation and Mini-Carnation)		
Operation	**Description** (Florval S.A.S. Branch QFC,	**Figures** (Taken by ICA, 2017)
	Algunas variedades susceptibles al maltrato mecánico o a que se quemen deben ser protegidas desde cultivo con papel dentro de los tabacos. Cada tabaco es identificado con una etiqueta que indica: variedad, cantidad de tallos, bloque de invernadero, el día de corte de la flor y la identificación del cortador.	

Table 5: Productive Process of Dianthus barbatus L.

Productive Process of Dianthus barbatus L.		
Operation	**Description** (Florval S.A.S. Branch QFC,	**Figures** (Taken by ICA, 2017)
Sowing	The plastic of the beds is washed and disinfected with sodium hypochlorite; Then the beds are filled with burned scale, which is also disinfected. Before planting, wash the bed with water so that there is no residue of chlorine and do not burn the root. Before planting, two meshes are placed to facilitate the tutoring when the plants grow. The average planting density is 40 plants / m2 net. The plants should be accommodated the first week after planting so that they anchor well on the substrate.	 
Selection of shoots	It is done between week 5 and 6 of the cycle, the 3 best stems are selected in terms of thickness and vigor. If there are reproductive stems, they are eliminated.	

Productive Process of Dianthus barbatus L.		
Operation	**Description** (Florval S.A.S. Branch QFC,	**Figures** (Taken by ICA, 2017)
		
Unbutton	It is performed between weeks 7 and 8, consists of removing axillary shoots; At the end of the work the first mesh is raised to support the stems. Three weeks later the second and last one is disbanded and the two meshes continue to rise. The lower mesh is placed 45 cm from the base of the bed.	
Cut	The cycle lasts 21 weeks from planting to cutting. The last three weeks are cutting. The cut is made when the head is round, and has a minimum opening diameter of 8 cm and a minimum stem of 45 cm high. The flower is cut and packaged in culture within tobaccos having a capacity of 20 stems on average. Each tobacco is identified with a label that indicates: variety, number of stems, block of greenhouse, the day of cut of the flower and the identification of the cutter.	

Monitoring

- Direct monitoring

The production site has trained personnel to conduct weekly monitoring in all production areas. The work is registered in monitoring charts that allow to visualize the phytosanitary status of

each of the areas of the crop. The personnel in charge are dedicated exclusively to the monitoring of phytosanitary problems and have the competences required for the identification in the field of insects and recognition of pathogens.

The head of Integrated Management of Plagues and Diseases (MIPE), the agricultural engineer, frequently trains personnel who monitor pests and diseases, in various technical subjects of their work, particularly in each of the biological targets of interest that affect the crops of Dianthus spp. (Florval S.A.S. Headquarters QFC, 2017).

Direct monitoring at the production site is carried out on a weekly basis at least 10% of the total crop. In each bed, at least three sites are inspected and at least three plants are inspected at each site from the bottom up to make a review of the three thirds (low, medium and high), in order to find in a timely manner the presence of possible damages or pests . Each week, 10% of the sampled area is broken (staggered) to the total area of the production site. In case of finding outbreaks of a pest, the entire bed is monitored and the infected area is identified with colored citations in order to perform the focused management (Florval S.A.S. Headquarters QFC, 2017).

- Indirect monitoring

Indirect monitoring employs traps and is focused on Thrips detection. In Colombia, ornamental plants for export are obliged to implement the detection, prevention and contingency plan established to date for Thrips palmi Karny and those established by the ICA for the management of phytosanitary problems of economic and quarantine importance in Ornamental species (ICA, 2008). It is obligatory to monitor this pest by means of external traps located in the four cardinal points of the property (1. North, 2. East, 3. South and 4. West).

Each trap must be monitored, quantified and cleaned twice a week; The monitor must count and record the number of thrips in the respective format (see Annex No. 1), after that the PVC pipe must be cleaned with a rag and soapy water, dry and apply a layer of oil. The format must be signed by the technical assistant and sent weekly to the ICA; Every 6 weeks, in addition to the completed format, the sample of thrips collected that week must be sent to the ICA laboratory. With the aid of a brush, the monitor should carefully remove the thrips from each of the traps and place them in an alcohol bottle (ICA - ASOCOLFLORES, 2005). To date, Thrips palmi Karny has not been reported on carnation crops in the Department of Cundinamarca.

Figure 11: Traps for surveillance of Thrips palmi Karny

Taken by: ICA, 2017.

The technical requirements of the trap for Thrips palmi are shown in Annex 1.

Information on direct and indirect monitoring is recorded in follow-up records that are used by the agronomist for decision-making and programming of controls to be implemented in accordance with the biological targets mentioned.

The places of production also have traps inside the greenhouses and perimeter traps to monitor susceptible varieties and thrips migration; these traps are white plastic plates of which are made reading and weekly count of thrips.

- Indirect monitoring of Botrytis in humid chamber for Dianthus caryophyllus

Mounts in a humid chamber are made in a shed next to a production greenhouse. This monitoring is done in order to identify the possible presence of Botrytis, since the condition of high relative humidity and temperature accelerates the metabolism of this pathogen. Once a week, flower stalks are collected and deposited every three naves inside the greenhouses, they are identified inside the humid chamber with the data of the block and bed to give traceability, to the seven days after the assembly in humid chamber is made Evaluation of the flowers and the respective format (Florval SAS Headquarters QFC, 2017).
D. barbatus is not affected by Botrytis (Florval S.A.S. Headquarters QFC, 2017).

Figure 12: Wet Chamber Exterior for Indirect Monitoring of Botrytis in Flower (Dianthus caryophyllus)

Taken by: ICA, 2017.

Figure 13: Wet Chamber Interior for Indirect Monitoring of Botrytis in Flower (Dianthus caryophyllus)

Taken by: ICA, 2017.

Stems Quality Vase Testing Kit

The flower is cut and the same process is performed as if it were to be dispatched to the final customer, for this a "trip simulation" is done where the flower is stored in a cold room for 15 days, after which it is entered into the room Vase tests. The cap is removed to the branches, the cut is renewed to the stems, are arranged in vase with the same treatment that the client applies to the branches and is monitored daily for 15 days, filling every day the life evaluation sheet In vase This procedure is followed to the quality of the flower that reaches the customers; Particularly it is verified that the product was dispatched free of Botrytis for the case of Dianthus caryophyllus; Dianthus barbatus is not affected by Botrytis in any crop condition (Florval S.A.S. Headquarters QFC, 2017).

Figure 14: Vase Test for Stems Quality Monitoring

Taken by: ICA, 2017.

Physical Control

Use of yellow plastic traps with Bio-Tac to attract thrips. Use of live fences around the place of production and use of barriers on canvas bordering the place of production. The outer curtains of the perimeter greenhouses are kept closed most of the time to avoid the entry of thrips and in general of insect pests; These curtains open on average four hours a day to allow greenhouse ventilation and relative humidity control (Florval S.A.S. Headquarters QFC, 2017).

Figure 15: Yellow Plastic Traps to Attract Thrips

Taken by: ICA, 2017

Cultural Control

The most commonly used prevention practices in Dianthus spp. They are:

Use of plant material registered before the ICA, planting density that allows aeration between plants, timely harvesting, maintaining cultural tasks today, weed control, manual weeding around hydroponic beds, hand and hoe weeding around greenhouses, hygiene And cleaning of the production area, curtain management to control relative humidity and temperature through ventilation, safe management of plant debris (removed from the production site and composted). They scythe gardens and around the greenhouses taking care to close the curtains of the greenhouses to avoid that the insects and vegetal residues enter these (Florval S.A.S. Headquarters QFC, 2017).

Biorational control

Foliar applications of vegetable extracts (garlic, chili), soaps, silicones and oils among others, are carried out to control some pests, especially for mites. The use of biorational products reduces chemical applications, thus reducing the pressure that favors resistance by pests (Florval S.A.S. Headquarters QFC, 2017).

Chemical Control

Plans for the application of chemical pesticides for agricultural use (PQUA) are established by agronomist engineers, as established in Resolution ICA 492 of 2008 - which establishes provisions on plant health for species of ornamental plants.

The chemical control is carried out through the use of fungicides and insecticides of chemical synthesis. A rotational program is operated according to the mechanism of action of the molecule that makes up the product and not its active ingredient, thus following the guidelines of the FRAC Fungicide Resistance Action Committee and the Insecticide Resistance Action IRAC (acronym in English). All phytosanitary products used for the production of Dianthus spp. Are registered before the ICA for use in ornamental plants.

The doses, period of application of the chemicals used and periods of re-entry to treated areas are done according to the indications of the label of each chemical pesticide for agricultural use (PQUA) and under the guidance of the agronomist responsible for plant health Of each place of production. Generalized and / or spot-based applications are programmed according to biological targets and incidents at the production site (Florval S.A.S. Headquarters QFC, 2017).

Table 6: General Phytosanitary Management of Dianthus spp.

Plague	**Management** (Florval S.A.S. Branch QFC, 2017)	**Dates and Stages of Higher**
Botryotinia fuckeliana (de Bary) Whetzel	Direct weekly monitoring in the field. Indirect weekly monitoring in the wet chamber. Follow-up to life in vase. Timely crops. Control of relative humidity in greenhouses by opening curtains to increase air circulation and between plants handling seed density that allows aeration between plants. Weekly chemical application according to monitoring.	In rainy times. Flowering (Arbeláez, 1987)
Fusarium oxysporum f. sp. *dianthi* (Prillieux & Delacroix) W.C. Snyder & H.N. Hansen	Direct weekly monitoring in the field. Counting and elimination of dead plants. Renovation of plants every 89 weeks or every 2 years, since old plants are much more likely to contract the disease. Weekly chemical application according to monitoring. Chlorine applications to slow the progression of disease when it occurs.	It can affect the plant in any phenological state (Florval S.A.S. Headquarters QFC, 2017)
Fusarium roseum Link: Fr.	Direct weekly monitoring in the field. Renovation of plants every 89 weeks or every 2 years, since old plants are much more likely to contract the disease. Weekly chemical application according to monitoring. Chlorine applications slow disease progression.	Propagation and in productive phase (Arbeláez, 1987)
Heterosporium echinulatum var. dianthi Losa	Direct weekly monitoring in the field. Identification and marking of foci with green rings. Manual eradication of affected leaves and structures, which are collected in plastic bags and taken to the composting area. Chemical application to foci and / or general according to monitoring. Control of relative humidity in greenhouses by opening curtains to increase air circulation and between plants handling seed density that allows aeration between plants.	It is presented mostly in rainy seasons. Rooting and productive phase (Arbeláez, 1987)

Plague	**Management** (Florval S.A.S. Branch QFC, 2017)	**Dates and Stages of Higher**
Peronospora dianthicola	Direct weekly monitoring in the field. Manual eradication of affected leaves and structures, which are collected in plastic bags and taken to the composting area. Chemical application to foci and / or general according to monitoring. Control of relative humidity in greenhouses by opening curtains to increase air circulation and between plants handling seed density that allows aeration between plants.	It is presented mostly in rainy seasons. It can affect the plant in any phenological state (Florval S.A.S. Headquarters
Myzus persicae (Sulzer)	Use of live fences around the place of production and use of canvas barriers bordering the production site to curb the entry of insect pests. Direct weekly monitoring in the field. Weekly chemical application according to monitoring.	It can affect the plant in any phenological state (Florval S.A.S. Sede QFC, 2017)
Tetranychus urticae Koch	Moisten paths between beds and central greenhouse pathway every day to slow the progress of mites towards plants. Chemical application to foci and / or generalized according to monitoring.	It is presented mostly in dry seasons. It can affect the plant in any phenological state (Florval S.A.S. Sede QFC, 2017)
Frankliniella occidentalis (Pergande)	Use of yellow plastic traps with Bio-Tac to attract thrips. They are inserted sandwiched in the beds; On the outer edge of the bed is not set up trap to not attract thrips from the outside of the greenhouse. Direct weekly monitoring in the field. Weekly chemical application according to monitoring.	It can affect the plant at any phenological state (Florval S.A.S. Sede QFC, 2017)

The majority of producers of flowers type export have the certification Florverde Sustainable Flowers, which is the main recognition given by the Colombian Association of Exporters of Flowers (Asocolflores). This scheme provides the norms for the certification of flowers and ornamentals independently and by third parties, based on ISO / IEC 17065; At the same time, ensures that only those products whose processes meet the quality, environmental and social requirements established in the Florverde (2017) normative documents are certified. The Florverde Sustainable Flowers certificate covers the following aspects:

- Management system
- Labor rights
- Training, training and well-being of workers
- Occupational safety and health management
- Water management and conservation
- Soil conservation, substrate management and fertilization
- Phytosanitary control and safe handling of pesticides
- Waste Management
- Farm, landscape and biodiversity management
- Energy, maintenance and carbon footprint
- Origin of the plant material
- Care of the product in poscosecha
- Traceability and records

It should be noted that this certification is not required by the ICA but is voluntary and depends on each production company to implement and certify.

7. Post-harvest activities, packaging, storage and transportation

Table 7: Post harvest process

Operation	**Description (Florval S.A.S. Headquarters QFC,**	**Figurs** (Taken by ICA, 2017)
Transport	The tobaccos are transported by cable from the crop to the post-harvest.	
	In the reception area of the postharvest, a phytosanitary quality assurance is made to 10% of the arriving flower; At the same time, verify that the information contained in the label corresponds to what is packaged in culture.	

Operation	Description (Florval S.A.S. Headquarters QFC,	Figurs (Taken by ICA, 2017)
Reception in post-harvest	It is loaded into the post-harvest inventory system, the flower that arrives from the field and enters the cold room. The tobaccos are unloaded from the cableway and are located in the window of the cold room.	 
Cold room storage	The tobaccos are stored in a cold room at an average temperature of 2 ° C and 95% relative humidity. The flower is organized by colors inside the cold room, in storage and transport trolleys, which holds up to 22 tobaccos.	
Exit flower to post-harvest room	The flower is moved from the cold room in transport trolleys to the sorting tables and boncheo. The flower that comes out is discharged from the cold room inventory.	
Classification and Boncheo	The flower passes to the classification tables and boncheo, this is distributed by colors among the operators, who carry out a classification process taking into account	

Operation	Description (Florval S.A.S. Headquarters QFC,	Figurs (Taken by ICA, 2017)
	Phytosanitary and quality grades according to stem length, then make the boncheo by arranging branches of 20 or 25 stems, according to the client's request.	 
Monitoring	Daily and constant monitoring of quality, in particular phytosanitary status in tables of classification and boncheo. A post-harvest phytosanitary monitoring format is used.	
Quality grades	Quality grades: Select: must measure 63 cm Fancy: should measure 56 cm Standard: should measure 45 cm Short: should measure 40 cm National: stems that do not meet the quality required for export. They are identified by the use of a guide rail located on an edge of the sorting table and boncheo.	

Operation	Description (Florval S.A.S. Headquarters QFC,	Figurs (Taken by ICA, 2017)
Conveyor belt	In the conveyor belt the ready branches are sent, according to what is being processed.	 
Hydration	The branches of Dianthus caryophyllus pass into hydration vats for 1 or 2 hours depending on the variety. Branches of Dianthus barbatus pass into hydration vats for 1 hour. Hydration Solution (Chrysal AVB 1 cc / L + Chrysal AVB Booster 1 cc / L + Water).	 
Monitoring		

Operation	Description (Florval S.A.S. Headquarters QFC,2017) and 2017a)	Figurs (Taken by ICA, 2017)
	Daily monitoring of quality, in particular of the phytosanitary status of branches in hydration vats and ready-to-dispatch branches. A post-harvest phytosanitary monitoring format is used.	 
Packing	It is packaged in carton boxes according to the customers' requirements, in terms of number of branches and assortment. For Diathus barbatus, usually 24 bouquets of 5 stems per full box or 14 bouquets of 10 stems per full box.	
Arrangement and storage of cartons	The cardboard area has enclosures to prevent the entry of insects.	

Operation	Description (Florval S.A.S. Headquarters QFC,	Figurs (Taken by ICA, 2017)
		
Box Labeling	All boxes containing cut flowers of Dianthus spp. For export, must possess the following identification (ICA, 2008): 1. Name of the exporting company. 2. Exporter registration number. 3. Readable label or inspection label. 1. 4. Registration number of the exporter.	
Packing boxes	They cover the boxes and are strapped. The packing area, strapping, cold packaged flower quarters and loading dock has security camera. A large number of production sites are certified by BASC (Business Alliance for Secure Commerce), which is an international business alliance that promotes safe trade in cooperation with governments and international organizations (BASC, 2017).	
Cood room	After the boxes are packed, they pass to the first cold room where they are stored temporarily at a temperature ranging between 2 and 3 ° C.	

Operation	Description (Florval S.A.S. Headquarters QFC,	Figurs (Taken by ICA, 2017)
		
Pre-cold Room	The boxes are stored at a temperature ranging from 1 to 2 ° C and 99% relative humidity for three hours, then they are taken to another cold room where the office is scheduled for the following day. A form of assurance of boxes to be dispatched is taken.	
Loading Dock	Loading dock monitored through security camera. Before loading the truck with the office it is checked that it is clean, that there is no humidity, that it does not have broken cans so that it does not present security problems.	

In order to ensure asepsis of the post-harvest room and in general of its work tools, the production sites carry out cleaning and disinfection procedures with different frequencies as required; With respect to the inspection tables, sorting tables and boncheo, tools, guillotines and knives are carried out a cleaning and disinfection before beginning the work, at noon and at the end The working day. The post-harvest room and cold rooms are

disinfected once a week (Florval S.A.S. Headquarters QFC, 2017).

Exporting companies must have a traceability system that allows them to specifically verify the farm from which the flower, volume and country of destination originates. In the same way, they must provide for each shipment of the phytosanitary certificate, issued by the professional responsible for the health of the material subject to export and / or phytosanitary certification issued by the ICA (ICA, 2008).

8. Information on monitoring systems

For the pests referred to in Annex 2 of the Australian questionnaire developed in the present characterization, which are: Burkholderia caryophylli, Carnation Italian ringspot virus (CarIRV), Carnation cryptic virus 1 (CCV1), Carnation cryptic virus 2 (CCV2) , Tabacco ringspot virus (TRSV), Sowbane mosaic virus (SMV / SoMV) are reported to be absent pests in Colombia.

Phytosanitary Surveillance is an official process that is carried out in a dynamic and continuous way. It includes evaluation, monitoring and other processes with technical-scientific support, which allow the determination of the presence or absence of pests in the national territory. It has the permanent support of professionals and Phytosanitary Diagnostic Laboratories.

The Colombian Phytosanitary Surveillance System is made up of General Surveillance and Specific Surveillance processes. General or passive surveillance is done by obtaining information through different sources (publications, congresses, reports, sensors) in relation to a particular pest. The active surveillance or specific survey is in which procedures are used to obtain information (monitoring) with respect to a particular pest, in specific sites of an area and during a determined period of time. Active surveillance applies to regulated pests established through Resolution ICA 3593 of 2015 (ICA 2015, ICA, 2017b).

Figure 16: Components of the Phytosanitary Surveillance System

Source: ICA, 2010.

Legal Control

Both production sites (establishments) and exporting companies (traders) of carnation cut flowers that want to export must register their places of production (land) before the ICA through resolution No. 492 of 2008 "For

which Lay down provisions on plant health for ornamental plant species "; Since only the export of registered places of production and marketers is allowed. The places of production and the registered marketers have technical assistance obligatory by an Agronomist or Agronomist with a professional card. It is responsible for the establishment of a permanent pest detection and monitoring program in accordance with the plans for the detection, prevention and contingency of pests of quarantine importance. In addition to this, registered farms are required to submit a quarterly report of the phytosanitary status of the crop before the ICA and to provide for each of the shipments or movement of flowers, of the phytosanitary record issued by the professional responsible for the health of the Material to be exported (ICA, 2008).

Exporting companies are obliged to export cut flower exclusively from crops that have technical assistance and certificate of land registration or exporter registration in force. They should also (ICA, 2008):

- Have control records (invoices, records, documents and forms) that support the provenance of cut flower
- used by the company for export purposes;
- Have the necessary infrastructure for the reception, classification and packaging of the flower to be
- commercialized.
- Have the phytosanitary certificate for each of the shipments, issued by the professional responsible
- for the health of the material object of export and / or Phytosanitary Certification issued by the ICA.
- Monitor and implement the pre-export control measures available for the technical management of
- quarantine pests in classification or post-harvesting rooms.
- Submit a quarterly report, of the species exported, volume and country of destination to the corresponding
- ICA section.
- Have a technical assistant to answer for the phytosanitary status of the offices.

The officials of the Technical Department of Plant Protection of the ICA, exercise control of compliance with the provisions established in the aforementioned resolution, through periodic visits to the different production sites and marketers of ornamental species destined for export or the national market (ICA, 2008).

9. Information on the official structure of the Phytosanitary Certification System

Phytosanitary Certificate for Export (CFE)

The ICA as the National Plant Protection Organization (NPPO) of Colombia issues the Phytosanitary Certificate for Export (CFE) according to the guidelines of the International Standard for Phytosanitary Measures (ISPM) No. 12 - Phytosanitary Certificates, issued by the International Convention on Phytosanitary Measures (IPPC) to protect the shipment and certify that it meets the requirements of the country of destination. The document contains sufficient information to clearly identify the submission, and includes comments if necessary (ICA, 2016).

The CFE is issued exclusively by authorized quarantine officers at ports, airports and border crossings (PAPF) on the day of shipment, after inspection of the material and verification of compliance with the requirements (ICA, 2016).

Procedures for the request of the CFE

When the importing country requires CFE, the request must be made by the interested party through the Health Information System for Import and Export of Agricultural and Livestock Products (SISPAP). Subsequently you must present the respective supporting documentation at the place of departure of the shipment so that the authorized quarantine officer can proceed with the inspection of the cargo and if appropriate issue the certificate that covers the dispatch. It is clarified that the exporter only has access to SISPAP once it has fulfilled all the requirements demanded by both the ICA and the NPPOs of the importing countries (ICA, 2016).

Additional Statements

Regarding additional declarations, when the importing country so requires, the exporter addresses a communication to the National Plant Quarantine Group (GNCV) specifying the place of departure of the consignment, country of destination and attached the document of phytosanitary requirements issued by the country In the case in which they issue), or official communication of the NPPO with such information. The CNGV establishes the acceptance criteria that must be fulfilled by the exporter and the authorized quarantine officer that can go from the request of a visit to the place of production to evaluate the conditions of production of the materials or products until the carrying out of diagnostic tests Certifying the phytosanitary status of the materials for compliance with the requirements of the additional declaration (ICA, 2016).

Detailed information on resolutions, requirements for registration as exporters and contact officials can be found at the following link: http://www.ica.gov.co/servicios_linea/sispap_principal.aspx

BIBLIOGRAPHY

Agrios, G. 1988. Phytopathology. Editorial LIMUSA. Department of Phytopathology. University of Massachusetts (United States). Mexico DF. 756pp.

Arbeláez, G. 1987. Fungal and Bacterial Diseases of Carnation in Colombia. Colombian Agronomy 1: 3-8.

Arbeláez, G. 1999. Overview of The Cut Flowers Pathology in Colombia. In: International Symposium on Cut Flowers in the Tropics. Acta Horticulturae 482, International Society for Horticultural Science (ISHS). U.S. 91-96pp.

BASC (Business Alliance for Secure Commerce). 2017. WORLD BASC ORGANIZATION. Http://www.wbasco.org/ (Last accessed: June, 2017).

Bigre, J. 1987. Pathology of Floral and Ornamental Crops. Ediciones Mundi - Press. Madrid. Spain. 233 pp.

Buriticá, P. 1999. Directory of Pathogens and Diseases of Plants of Economic Importance in Colombia. Produmedios. Bogotá D.C. Colombia. 329 pp.

Bustillo, A. & G. Sánchez. 1977. Aphids in Colombia, pests that affect agricultural crops of economic importance. Instituto Colombiano Agropecuario (ICA) and the Administrative Department of Science, Technology and Innovation (COLCIENCIAS). Bogotá D.C. Colombia.

CABI. 2016. Crop Protection Compendium. Wallingford, UK: CAB International. Www.cabi.org/cpc. (Last access: February, 2016).

CABI. 2017. Crop Protection Compendium. Wallingford, UK: CAB International. Www.cabi.org/cpc (Last access: July, 2017).

Ceballos, J., González, D. & G. Arbeláez. 1990. Determination of the physiological races of Fusarium oxysporum F. Sp. Dianthi in carnation in the Savanna of Bogota. Revista ASOCOLFLORES 23: 4-8.

Florval S.A.S. Headquarters QFC. 2017. Personal communication. System of Cut Flower Production of Dianthus caryophyllus L. June.

Florval S.A.S. Headquarters QFC. 2017a. Personal communication. System of Cut Flower Production of Dianthus barbatus L. July.

Florverde Sustainable Flowers, 2017. Florverde Standard Version 7.0 January 2017 for the sustainable production of flowers and ornamentals. Colombian Association of Flower Exporters (Asocolflores). Equilibrio Gráfico Editorial Ltda.

Gallego, F. & R. Vélez. 1992. List of insects that affect the main crops, forest plants, domestic animals and the man in Colombia. National University, Medellín Section. Center of Publications of the National University, Medellín Section. 198 pp.

Getiva, J. & A. Acosta. 2004. Taxonomy of mites associated with flower crops. Revista Asocolflores 59-75 pp.

Gill, S., Clement, D. & E. Dutky. 2001. Pests and Diseases of Flower Crops. Biological Strategies. Ediciones HortiTecnia Ltda. Bogotá D.C. Colombia. 304 pp.

Gómez, T. 2013. Characterization of isolates of Botrytis cinerea de rosa in the Savannah of Bogotá. Master's Degree in Agricultural Sciences with emphasis in Phytopathology. Faculty of Agrarian Sciences. National university of Colombia. Bogotá D.C. Colombia. 88pp.

ICA (Instituto Colombiano Agropecuario). 2008. Resolution ICA No. 492 "By which provisions are issued on plant health for species of ornamental plants".

ICA (Instituto Colombiano Agropecuario) - ASOCOLFLORES (Colombian Association of Flower Exporters). 2005. Quarantine pests and diseases in cut flowers. Produmedios. Bogotá D.C. Colombia.

ICA (Instituto Colombiano Agropecuario). 2010. National Phytosanitary Surveillance System. Technical Direction of Epidemiology and Phytosanitary Surveillance.

ICA (Instituto Colombiano Agropecuario). 2015. Resolution ICA No. 3593 "By means of which the mechanism for establishing, maintaining, updating and disseminating the list of regulated pests of Colombia" is created.

ICA (Instituto Colombiano Agropecuario). 2016. Phytosanitary Certification of export of fresh agricultural products. National Group of Vegetable Quarantine. Border Protection Assistant.

ICA (Instituto Colombiano Agropecuario). 2017a Carnation export production sites registered with the ICA. National Ornamental Program. Technical Direction of Plant Health.

ICA (Instituto Colombiano Agropecuario). 2017b. Resolution ICA No. 6630 "By means of which modifies the Annex of Resolution 3593 of October 9, 2015".

IDEAM (Institute of Hydrology, Meteorology and Environmental Studies). 2017. Climatological Atlas of Colombia. Http://atlas.ideam.gov.co/visorAtlasClimatologico.html (Last access: June, 2017).

IGAC (Agustín Codazzi Geographic Institute). 2007. Collection: General study of land and zoning by departments.

Malais, M. & W. Ravensberg. 2006. Knowing and Recognizing the Protected Crops Pests and their Natural Enemies. Koppert B.V. The Netherlands.

Mound, L. & Isaza, J. 1994. Trips common in the savanna of Bogotá. Asocolflores (Colombian Association of Flower Exporters) (38): 55-59.

Murillo, A. & F. Mosquera. 1984. Evaluation of the resistance of Tetranychus cinnabarinus (Boisduval) to various pesticides used in exporting carnations. Summaries XI Congress Colombian Society of Entomology (SOCOLEN). Pasto, Colombia. 66 pp.

NPGS. U.S. National Plant Germplasm System. 2008. Germplasm resources information Network (GRIN). United States Department of Agriculture, Agricultural Research Service.
Https: //npgsweb.ars- grin.gov/gringlobal/taxonomydetail.aspx?id=13817 (Last accessed: July, 2017).

NPGS. U.S. National Plant Germplasm System. 2011. Germplasm resources information Network (GRIN). United States Department of Agriculture, Agricultural Research Service.
Https: //npgsweb.ars- grin.gov/gringlobal/taxonomydetail.aspx?13826 (Last Accessed: May, 2017).

Patil, D., Patel, K., Toke, N. & A. Ambule. 2014. Biology of Tetranychus urticae Koch (Acarina: Tetranychidae) on carnation under laboratory conditions. International Journal of Plant Protection 7 (2): 334-338.

Pérez, S. 2003. Manual of establishment and management practices for the cultivation of carnation (Dianthus caryophyllus L.) in Colombia. Degree monograph to choose the title of specialist in Horticulture. National university of Colombia.

Pizano, M. 2000. Carnation: Dianthus caryophyllus. Ediciones HortiTecnia Ltda. Bogotá. Colombia. 181 pp.

PNF (National Fruit Plan). 2006. Development of fruit growing in Colombia. Ministry of Agriculture and Rural Development (MADR), Departmental Governments, National Horticultural Development Fund (FNFH), Asociación Hortifrutícola de Colombia (ASOHOFRUCOL). Sociedad de Agricultores y Ganaderos del Valle del Cauca (SAG).

Reitz, S. 2009. Biology and ecology of the western flower thrips (Thysanoptera: Thripidae): The making of a pest. Florida Entomologist. 92: (1) 7-13.

Annex 1

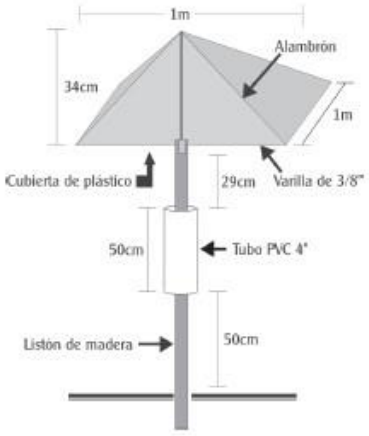
Traps for surveillance of Thrips palmi Karny and detection form (ICA - ASOCOLFLORES, 2005).

Materials for monitoring

- *Plastic containers with airtight lid for sampling (bottles - Eppendorf 1.5 ml).*
- *Antiseptic alcohol (70%).*
- *Fine tip brush, # 0 or 1.*
- *Pencil.*
- *Labels of paper or white paperboard to label the sample bottle.*
- *Field report forms (see Annex No. 2).*
- *10 or 20 magnification magnifying glass.*
- *Rags*
- *Soapy water*

Trap Specifications

The trap (Figure No.18) is constructed with a 50 centimeter section of 4 "PVC PVC pipe, which will be painted white. It will be fixed to the ground by an immunized wooden stake of 5 centimeters of side and 1.8 meters of height. The trap shall be placed vertically above the ground, with a distance of 50 centimeters between the lower edge and the floor surface. The stake must go through the tube light (to the inside) so that the entire white surface is exposed. The tube will be impregnated with 20W-40 / 20W-50 motor oil without burning, as colorless as possible, which will be the adhesive for the capture of the pest. The trap will be protected by a plastic cover of the same specifications used for the construction of greenhouses. This will have an area of 1 square meter, four waters and a central axis height of 34 centimeters. For the construction of the deck, 3/8 "rod will be used in the central axes, 5 centimeters of 1" galvanized pipe to anchor the deck on the wood stake. The rest of the structure will be constructed with 1/8 "galvanized wire. The purpose of the cover is only to protect the trap from the effect of rain.



Exterior Trap Scheme

Form for the Weekly Thrips Detection Report

FORMULARIO PARA EL INFORME SEMANAL DE DETECCIÓN DE THRIPS			
FECHA	SEMANA	FINCA O PREDIO	
INFORMACIÓN SOBRE CAPTURA DE THRIPS (El cuadro se llena con el número de Thrips capturados en las trampas)			
TRAMPA #	1er. DIA	2do. DIA	TOTAL
TRAMPA 1			
TRAMPA 2			
TRAMPA 3			
TRAMPA 4			
		TOTAL	
¿Envía muestras de trampas externas?		Si ☐	No ☐
¿Envía muestras de monitoreo interno del cultivo?		Si ☐	No ☐
El asistente técnico del cultivo en ejercicio de su cargo hace constar que la información contenida en este formulario se ajusta a la verdad. _____ _____ Nombre Firma			
Observaciones ICA_____ _____ _____ _____			
Funcionario ICA que recibe _____ _____ **Nombre** **Firma**			
Fecha de recibo:			